The purpose of this document is to provide an overview of the Deactivation and Decommissioning D&D Focus Area and to update readers on the program's current activities. It presents a synopsis of the current program status and recent accomplishments, along with overviews of planned activities, program issues, and opportunities. Quarterly reports are distributed to U.S. Department of Energy DOE headquarters and operations office managers, site personnel, site operating contractors, technology developers, principal investigators, regulators, and other stakeholders. Issued in January, April, July, and October, the D&D quarterly reports summarize the activities of each preceding quarter. Quarterly reports and further information about the D&D Focus Area DDFA are found on the World Wide Web at *www.netl.doe.gov/dd*. Technologies are usually identified by their discrete tracking numbers within the Technology Management System (TMS) operated by DOE's Office of Science and Technology (OST). Providing access to information about OST programs, technologies, and linkages to EM problems, TMS is found on the World Wide Web at *ost.em.doe.gov/tms/home/entry.asp*.

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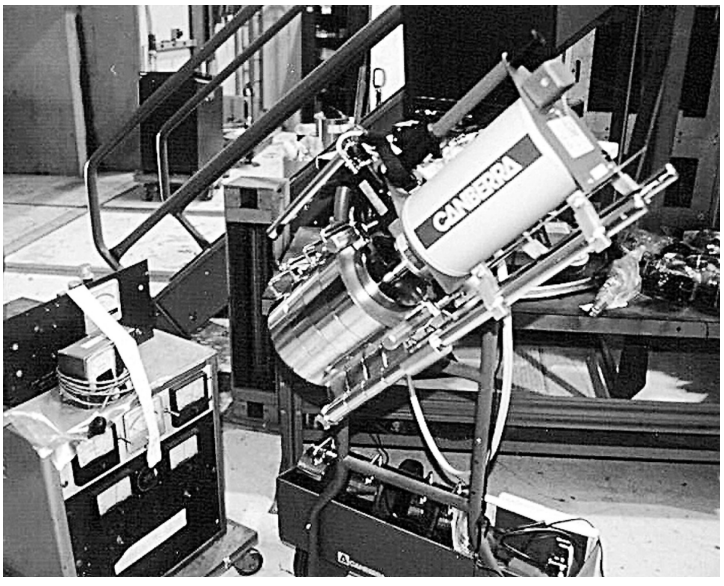
1.0 HIGHLIGHTS

Deactivation and Decommissioning Focus Area Proposes to Work with Interstate Technology Regulatory Cooperation.

For the first time, NETL's Deactivation and Decommissioning Focus Area (DDFA) has proposed to work with the Interstate Technology Regulatory Cooperation (ITRC) coalition in DDFA activities that could benefit from involvement of the state regulatory community. The first proposed area of cooperation is on the regulatory aspects of the Mound Facilities Long-Term Stewardship Initiative to provide long-term monitoring of buildings transferred to the Mound Miamisburg Community Improvement Committee for occupancy by the private sector, while the second proposed area of cooperation involves regulatory acceptance of data generated from real-time field instruments used to measure radioactive and chemical contamination. The ITRC is a coalition of state regulators who create tools and strategies to reduce interstate barriers to deployment of innovative and improved environmental remediation technologies. ITRC involvement in these DDFA activities should ease and accelerate DOE complex-wide deployment of DDFA's improved technologies for long-term stewardship and real-time field characterization instruments.

Benefits of In Situ Object Counting System Confirmed in Decommissioning Project at Brookhaven Graphite Research Reactor.

As part of a NETL DDFA-sponsored Accelerated Site Technology Deployment (ASTD) project, Canberra's In Situ Object Counting System (ISOCS) was used to characterize the Pile Fan Sump Above-Ground Ducts, contaminated cooling fans, and graphite pile internals in the Brookhaven Graphite Research Reactor decommissioning project. ISOCS is a battery-operated, field-deployable gamma spectrometer that identifies and quantifies gamma-emitting radionuclides. The data generated by ISOCS met quality control and assurance standards established by the decommissioning project and only minor differences were noted in comparing ISOCS data to data from other gamma spectrometers and laboratory analyses. Based on results of this technology deployment, ISOCS reduces characterization costs by 72 to 92 percent compared to the baseline approach of sampling and laboratory analysis. ISOCS also provides data in near real time compared to days or weeks for results from laboratory analysis. Based on these encouraging results, the DDFA has initiated another ASTD project with the Nevada Test Site (NTS) to characterize equipment and soil using ISOCS. Personnel from Brookhaven National Laboratory will initially assist NTS in deployment of ISOCS.



Canberra's In Situ Object Counting System (ISOCS) is a battery-operated, field-deployable gamma spectrometer that identifies and quantifies gamma-emitting radionuclides.

2.0 Project Summary Table

The following table summarizes the Technical Task Plans for the D&D Focus Area Core Program and related Crosscutting and Industry Program contracts. Project descriptions follow in subsections 2.1 through 2.5 and are organized by the work breakdown structure WBS element listed here.

Project Number	D&D WBS Element	Project Name	Page
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ID08DD21	Demonstrations and Industry Approaches	Large-Scale Demonstration: Idaho National Engineering and Environmental Laboratory Fuel Storage Canals and Underwater and Underground Facilities	10
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SR09DD61	Demonstrations and Industry Approaches	Highly Selective Nuclide Removal System—Accelerated Site Technology Deployment	12
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AL08SD10	Demonstrations and Industry Approaches	Los Alamos National Lab Decontamination and Volume Reduction System—Accelerated Site Technology Deployment	—
NV09DD61	Demonstrations and Industry Approaches	Oversize Transuranic Waste Laser Cutting System, Nevada Test Site—Accelerated Site Technology Deployment	14
CH	Demonstrations and Industry Approaches	Smart 3-D Characterization of the Brookhaven Graphite Research Reactor (BGRR)	15
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OH	Demonstrations and Industry Approaches	Diamond Wire Saw Demolition and Size Reduction of a Reactor Bioshield—Accelerated Site Technology Deployment	18
OH	Demonstrations and Industry Approaches	Reducing, Reusing, and Recycling Concrete and Segmenting Plate Steel and Tanks Utilizing a Universal Demolition Processor—Accelerated Site Technology Deployment	19

Project Number	D&D WBS Element	Project Name	Page
OH	Demonstrations and Industry Approaches	Improved Measurement and Monitoring Systems—Accelerated Site Technology Deployment	—
OH	Demonstrations and Industry Approaches	Intrusive and Non-Intrusive characterization through Concrete Walls and Floors—Accelerated Site Technology Deployment	20
NV01DD32	Demonstrations and Industry Approaches	MARSSIM Innovative characterization at Nevada—Accelerated Site Technology Deployment	21
SR01DD22	Demonstrations and Industry Approaches	Contaminated Large Equipment—Accelerated Site Technology Deployment	22
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Multiple Projects	Demonstrations and Industry Approaches	Florida International University	24
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DE-AR26-98 FT 40365	Facility Characterization	Fast Response Isotopic Alpha Continuous Emissions Monitor	28
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FT06IP01	Facility Decontamination	Technology Deployment for Asbestos Destruction	31
Multiple Projects	Facility Dismantlement and Material Disposition	Robotics Crosscutting Program	32
DE-AC21-93 MC30179	Worker Safety/Other	Protective Clothing Based on Permselective Membrane and Carbon Adsorption	33
FT06IP01	Worker Safety/Other	Integrated D&D Decision Analysis Tool	34
DE-AR26-98	Worker Safety/Other	Modular Manipulator for Robotic Applications	34

2.1 Demonstration and Industry Approaches

LANL TRU Waste Characterization, Decontamination and Disposition LSDDP

Objective and Scope: The Los Alamos National Laboratory (LANL) Transuranic (TRU) Waste Characterization Decontamination and Disposition Large Scale Demonstration and Deployment Project (LSDDP) addresses the characterization, decontamination, and volume reduction of oversized metallic transuranic (TRU) waste currently in storage at LANL's storage and disposal area, TA-54. The LANL LSDDP reflects the cooperative interest of industry, government, and academia to bring collaborative expertise and strength to DOE's TRU decontamination and decommissioning program at LANL and elsewhere within the DOE complex. LANL currently has 1,500 m^3 of TRU waste in inventory, has 313 plutonium-contaminated gloveboxes in a 24,000 ft^2 facility, and expects to generate another 2,500 m^3 from ongoing operations in coming years.

The major objectives of this LSDDP are:

- Identify technologies that are ready for deployment for the characterization, decontamination, and volume reduction of TRU waste/TRU contaminated metallic objects.
- Identify technologies that are ready for demonstration.
- Demonstrate those technologies with potential to reduce cost, risk and schedule and that are amenable for direct field application at Los Alamos and elsewhere in the DOE complex.
- To the extent possible compare technologies "side by side" with baseline approaches to evaluate their advantages (cost, risk, schedule) and refine/validate baseline assumptions.
- Capitalize on the combined corporate management and technical strength of private industry, government, and academia.
- Demonstrate a leveraged funding pool of federal and private monies via cost sharing to address issues of national importance.
- Provide ready access to demonstration results through an aggressive communication program.

Crates of plutonium-contaminated gloveboxes stored at Los Alamos National Laboratory (LANL) are destined for permanent disposal at the Waste Isolation Pilot Plant (WIPP)

Status and Accomplishments: Technologies for possible demonstration in the areas of crate opening, size reduction of TRU metal, air filtration, PPE, and communications, decontamination, and air monitoring were discussed. Possible technologies for demonstration include advanced nuclear air pre-filter to increase life of downstream HEPA filters, FIU crate cutter, steel cutting circular saw, RaceScan communications system, dry ice blasting, clamshell cutter, wire saw, electrochemical decontamination, aerosol fogging, Brokk, strippable coating, and strippable coating rollup machine, and mercury monitor. Fast CAM and RaceScan were identified as near-term demonstrations.

Current Reporting Period Activities: A pre-LSDDP demonstration of the Evolution 180 circular saw by Nuclear Fuel Services was conducted. The saw was impressive in cutting through 1/4-inch aluminum plate.

The Vehicle and Cargo Inspection System (VACIS) is being returned to LANL for a deployment opportunity.

For more information:

http://www-emtd.lanl.gov/LSDDP/DDtech.html

Tech ID 2203

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The Mound Plant, Miamisburg, Ohio commenced operation in 1948.

Mound Tritium D&D LSDDP

Objective and Scope: The Mound Plant in Miamisburg, Ohio began operations in 1948. The site's mission, originally to fabricate the neutron initiator for the atomic bomb, expanded to include research, development, and production of numerous nuclear and non-nuclear weapons components, production of radioisotopically fueled thermoelectric generators, and surveillance of nuclear weapons components.

The objective of the Mound Tritium D&D LSDDP is to identify, demonstrate, and evaluate innovative technologies applicable to the decontamination and decommissioning (D&D) of tritium facilities. D&D of Mound's surplus tritium facilities, the T and R/SW Buildings, provides a unique opportunity to compare, evaluate, and eventually execute innovative D&D technologies alongside baseline technologies in an ongoing project. The Mound LSDDP will identify and explore methods to improve worker safety while achieving cost and schedule savings. The project is expected to identify technologies that, when implemented in the Mound LSDDP, will produce significant savings compared to the $57.8 million baseline. The results and successes of this demonstration project will benefit similar DOE facilities and projects.

The T Building is an underground reinforced-concrete structure built in 1948 for the purification of polonium-210 used in nuclear weapons initiators. Later the facility was used to extract other radionuclides, house the plutonium verification facility, and store TRU materials. Facilities large enough to handle multi-kilogram quantities of tritium were added to the building. Current plans are to decontaminate T Building to potentially allow unrestricted public reuse by the year 2003. The SW Complex and one corridor of rooms in the adjacent R Building form the SW/R Complex. Four types of operations have been performed in these facilities to support nuclear weapons programs using tritium: component development, component evaluation operations, tritium recovery, and material analysis. To meet DOE's vision of completing the environmental restoration of the site by 2005, the SW/R Tritium Facilities will be demolished, and contamination beneath the building will be removed.

It is anticipated that innovative technologies will be applied to the following decontamination tasks:

- tritium-contaminated gloveboxes
- tritium characterization techniques
- productivity improvement technologies
- tritium specialties decontamination
- piping system removal and disposition
- mixed waste treatment and disposal
- tritiated water treatment
- contaminated water plume under SW building
- miscellaneous rad/non-rad traditional building materials disposition

The Mound LSDDP IC Team includes Babcock & Wilcox of Ohio, Lawrence Livermore National Laboratory (LLNL), British Nuclear Fuels Limited (BNFL), Foster Wheeler, IT Corp, Los Alamos National Laboratory (LANL), Westinghouse Savannah River, Princeton Plasma Physics Laboratory (PPPL) and Florida International University (FIU).

Status and Accomplishments:

Completed Demonstrations:

1. ***Portable Scintillation Counter (Tech ID 2311):*** The Lumi-Scint portable scintillation counter is a portable, single-tube liquid scintillation counter that can be set to respond to the low-energy beta radiation emitted from tritium. It uses a single photomultiplier tube and manual sample chamber. The Lumi-Scint can operate from an internal battery or 110 VAC for its operation. The unit can be obtained with a

printer, which allows hard copies of its electronically stored data.

2. ***Water Solidification (Tech ID 2312):*** This technology uses polymer-based absorbent (Waterworks SP-400) that can be used to solidify aqueous waste. It is similar to other polymer-based absorbents that offer benefits over traditional solidification agents such as cement or the Mound facility baseline solidification agent, Aquaset. Benefits include: a high liquid-to-absorbent ratio; no mechanical mixing required to promote the absorption process; little to no volume increase in the waste form after addition of the absorbent; and a very high retention in the form of the gel-like material.
3. ***Oil Solidification (Tech ID 2313):*** This contaminated oil solidification technology—NOCHAR PetroBond®—is a high-quality polymer offered by NOCHAR®, Inc., of Indianapolis, Indiana, and is specifically designed as a petroleum-based liquid absorbent. The PetroBond® absorbs very quickly with little increase in volume. The PetroBond® can be used for free-liquid control in storage, transport, and disposal of low-level radioactive waste.
4. ***Tritium Clean-Up Cart (Tech ID 2974):*** The Tritium Clean-Up Cart is a portable, tritium Processing System Clean-Up Cart. Used as a stand-alone cart for scrubbing tritium effluent, it provides a scrubbing process based on catalytic oxidation of tritium. Tritiated water is collected on removable molecular sieve dryers, which can be shipped as low-level waste below the 1080 curie "Type A" limit. The unit provides a projected decontamination factor of greater than 1000, with a process flow rate of 45 liters per minute. Design features include: mole sieve dryer beds configured in series with moisture monitors to prevent moisture breakthrough; process flow controllers in the main plumbing loop and air inlet system; process thermocouples, which provide process stream and enclosure over-temperature control; and an enclosure that can function as a ventilated hood during normal operating conditions, but can be isolated when tritium concentrations inside the enclosure exceed the pre-selected control setpoint.

The Tritium Clean-Up Cart was demonstrated as part of the Mound LSDDP

5. ***Pipe Cutting and Crimping System (Tech ID 2955):*** The Pipe Cutting and Crimping System is a small hand-held, battery-operated crimping tool manufactured by Burndy Products. This tool uses a separate hydraulic pump with a high-pressure hose connected from the pump to the crimping head. U-shaped dies are contained in the head for crimping. A battery-powered hydraulic pump or electric-powered pump can be used to develop 10,000 psi of pressure to the crimping head. Thirty crimping operations can be performed before recharging is needed. The small dimension and lightweight make this tool very suitable for crimping in tight quarters.
6. ***Barter Process Demonstration:*** The purpose of the Barter Process Demonstration is to demonstrate the potential savings to Mound of a bartered sale agreement and contaminated equipment transfer to a commercial company, with support provided by DOE-Ohio and the National Metals Recycling Center.
7. ***TechXtract® Chemical Decontamination of Metals (Tech ID 1450):*** TechXtract® is a contamination extraction technology that uses chemical formulations to remove contaminants from matrix surfaces and sub-surfaces. Different chemical formulations are used for removal of specific contaminants from metal surfaces and sub-surfaces. In this demonstration, the technology was successfully shown to decontaminate volumetrically contaminated stainless steel equipment. The demonstration showed greatly improved decontamination efficiency compared to the baseline method of decontamination using hydrogen peroxide.

8. ***Heavy Metals Removal from Mixed Waste Oils Using SAMMS:*** The SAMMS technology was developed by the Pacific Northwest National Laboratory (PNNL) for removal and stabilization of RCRA metals (i.e., lead, mercury, cadmium, silver, etc.) and for removal of mercury from organic solvents. The SAMMS material is based on self-assembly of functionalized monolayers on mesoporous oxide surfaces. The unique mesoporous oxide supports provide a high surface area, thereby enhancing the metal-loading capacity. SAMMS material has high flexibility in that it binds with different forms of mercury, including metallic, inorganic, organic, charged, and neutral compounds. It removes mercury both from organic wastes such as pump oils and from aqueous wastes.

Ongoing Demonstrations:

1. ***E-PERM: The E-PERM® (Electret-Passive Environmental Radiation Monitor)*** is a commercially available instrument and its technology is designed to provide faster and less expensive means of determining the tritium contamination in air and on solid surfaces. For measurement of airborne tritium, the E-PERM® monitor uses a chamber made of carbon filled polypropylene. The window is made of thick carbon coated Tyvek® material, which is highly transparent to water vapor. For tritium surface monitoring, the E-PERM® system is used in a windowless mode. A mesh, supplied by the manufacturer, is used over the surface of a contaminated object before deploying the electret ion chamber to prevent contamination of the chamber. This demonstration is ongoing and results of the demonstration will be available in late FY2001.
2. ***Waste Isolation Composite (WIC):*** The WIC is an ultra-high-strength composite material with high durability and low permeability that can be used for isolation or encapsulation of high-activity tritiated liquids. This is especially useful for disposal of liquid waste with high-curie-content tritiated water. This demonstration is ongoing and results of the demonstration will be available in the third quarter of 2001.
3. ***Fiber Optic Tritium Detector and Quantifier System (Tech ID 2956):*** This technology, developed by McDermott Technologies, Inc., uses a fiber optic bundle coupled to a photomultiplier tube detector to measure low-energy beta radiation from radioactive decay of tritium. It allows the fiber bundle to be introduced directly in the liquid (oil or water) sample for tritium detection and quantification. This technology is currently being demonstrated.
4. ***TechXtract® Chemical Decontamination of Concrete (Tech ID 1450):*** TechXtract® is a contamination extraction technology that uses chemical formulations to remove contaminants from matrix surfaces and sub-surfaces. Different chemical formulations are used for removal of specific contaminants from concrete surfaces and subsurfaces. This demonstration was initiated near the end of March 2001, at the Lawrence Livermore National Laboratory. Some initial coring indicated that there is tritium contamination in the concrete. The full-scale portion of the demonstration is expected to begin in April.

Current Reporting Period Activities:

The Equipment Reuse, Bartered Sale of Used Contaminated Equipment to a Commercial Company (Barter Process) demonstration was recently completed. As a closure site, much of the DOE Miamisburg Environmental Management Project's equipment is planned for disposal. The Mound LSDDP team, instead of considering disposal as a first option, has demonstrated that there are benefits to the reuse of equipment at another facility or company over disposal. They recently completed a process to transfer used, tritium-contaminated equipment to a commercial company by means of a bartered sale agreement. The commercial facility was a Texas-based, NRC-licensed pharmaceutical company. The Mound LSDDP team effectively applied the process knowledge and methodology developed by the DOE National Center of Excellence for Metals Recycle (NMR) in Oak Ridge to facilitate equipment reuse at many DOE sites. NMR checklists stepped through the entire process, and they also aided in evaluating potential equipment reuse prospects. The Mound Bartered Sale

agreement was negotiated, and the first shipment of used equipment has been completed. Additional shipments will follow. As a result, DOE expects to avoid over $400,000 in equipment disposal costs and an additional $1 million by shortening the schedule for site closure. Based on the experience gained from accomplishing this project, the Mound LSDDP team isdocumenting the process so that other DOE sites can benefit from such equipment recycle and reuse agreements.

Also in the current period, demonstration of the TechXtract® chemical treatment to remove surface (and potentially near-surface) contamination from concrete was initiated in a tritium laboratory at the Lawrence Livermore National Laboratory. Some initial coring indicated that there is tritium contamination in the concrete. The full-scale portion of the demonstration is expected to begin in April.

For more information:

http://www.doe-md.gov/lsdd/lsdd.htm

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▼INEEL Fuel Storage Canals and Associated Facilities D&D LSDDP

Objective and Scope: The Idaho National Engineering and Environmental Laboratory (INEEL) Fuel Storage Canals and Associated Facilities LSDDP is led by an IC Team consisting of Parsons Engineering, BNFL, BBWI, TLG Engineering, FIU, and Idaho State University. This LSDDP will utilize funding, technologies, and expertise from the Offices of Environmental Restoration, Science and Technology, and Nuclear Material and Facility Stabilization, and from industry, universities, and the international community.

The project includes the following areas:

- Test Reactor Area TRA-660, housing two underwater research reactors, the Advanced Reactor Measurement Facility and the Coupled Fast Reactivity Measurement Facility, with a 30,000-gallon interconnecting water canal that was sometimes used for fuel storage. These facilities were utilized for reactivity insertion experiments that were later scaled up for experiment design in larger reactors. The two reactors achieved criticality in 1960 and 1962, respectively. Neither has operated since February 1991. Contamination includes radioactive elements, lead, and chromium.
- TRA Filter Pit system, consisting of five structures containing large filters associated with test reactor operations. The facilities are contaminated with lead, radioisotopes, and deteriorating asbestos. The filters are located in restricted entry pits, and D&D work will have to be done remotely and in confined spaces.
- Test Area North TAN-620 Initial Engine Test Control Room, a massive underground, shielded, heavily reinforced concrete structure that served as the control center for the engine tests in the Aircraft Nuclear Propulsion Program conducted at the INEEL in the late 1950s and 1960s. Contamination includes asbestos, mercury, lead, and potential radiation.

This LSDDP is a high priority for the DOE/Commercial Nuclear Utilities D&D Consortium, with demonstrated technologies having deployment opportunities in the nuclear utility market through the consortium. Resulting deployments throughout the DOE complex alone could generate a potential cost savings and mortgage reduction of $20 million.

Eleven to18 innovative and improved technologies will be demonstrated in the areas of underwater inspection, characterization, and dismantlement; inspection, characterization, and dismantlement in restricted spaces; recycle of materials from D&D activities; removal of loose radiological contamination on walls, floors, piping, and equipment; removal of fixed radiological contamination on concrete; tank, vessel, and piping decontamination; lead plate radiological decontamination; and high-radiation exposure fields.

Status and Accomplishments: The Russian technology is currently awaiting release by the government authorities for shipment to the United States.

Current Reporting Period Activities: INEEL is currently working with DOE and the Research and Development Institute of Construction Technology (NIKIMT) in Moscow, Russia, to demonstrate a Russian technology. The technology is a non-tethered 3D-Gamma Locator Device (GLD) that provides three-dimensional characterization of radioactivity in areas of high levels of radioactivity. This is a robotic unit that provides results to a computer-based control system. The first phase testing of the technology was successfully accomplished in Russia during an earlier period. An Isotopic Identification Device (IID) is to be attached to the robot to identify the isotopes generating the radioactivity observed by the GLD during the demonstration. A robot will be provided by the INEEL robotics crosscut program to mobilize the GLD and the IID to remotely characterize the rooms in Test Area North (TAN) Building TAN 616. The robot, GLD, and IID all operate remotely and completely untethered, making them unique to other technologies. The demonstration was postponed due to the equipment not being released by the Russian Ministry. The demonstration will be rescheduled when a tentative release date has been established by the Russian Ministry.

For more information:

http://id.inel.gov/lsddp/

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Canyon Disposition Initiative

Objective and Scope: The Hanford Canyon Disposition Initiative (CDI) Project is a collaborative project that initially included participation across the DOE Office of Environmental Management (EM). Participating EM offices included the Offices of Waste Management Environmental Restoration, Science and Technology, and Nuclear Material and Facility Stabilization. This partnership was driven by the broad and significant impact that decisions made on the disposition of the canyons would have to all of these programs. Due to the reorganization of EM in September 1999, CDI is being overseen by the newly created Office of Project Completion.

The CDI Project is evaluating the feasibility of using the five chemical processing facilities (canyons) as assets for disposal of low-level wastes, instead of a mortgage liability. The 221-U Facility is being used as a pilot for this evaluation. The DOE Richland Operations Office (RL) Environmental Restoration Program signed an Agreement in Principle with the regulators at the beginning of FY 1997, to conduct the evaluation for the disposition alternatives for the canyon facilities. In 1996, a Canyon Task Team of personnel from RL, the U.S. Environmental Protection Agency, and the Washington State Department of Ecology (known as the Tri-Parties) conducted a series of workshops to identify an approach for the long-term disposition of the five main processing facilities in the 200 Area (B, T, and U facilities, the Plutonium Uranium Extraction Facility and the Reduction Oxidation Plant) at the Hanford Site. The assessment made by the Canyon Task Team centered on the possibilities of removing the processing facilities, leaving all or part of the facilities in place and identifying alternative beneficial uses for the

facilities. The team concluded that the technical approach for dispositioning any of the facilities could be bounded by the following seven alternatives:

Alternative 0:
No Action

Alternative 1:
Full Removal and Disposal

Alternative 2:
Decontaminate and Leave in Place

Alternative 3:
Entombment with Internal Waste Disposal

Alternative 4:
Entombment with Internal/External Waste Disposal

Alternative 5:
Close in-Place—Standing Structure

Alternative 6:
Close in-Place—Collapsed Structure

The Record of Decision for the 221-U Facility will generate regulatory and technical precedence for future disposition of the other four remaining processing facilities at Hanford and other such facilities across the DOE complex.

Status and Accomplishments: Approximately $200,000 in funding from FY2000 has carried over into FY2001 for Phase III feasibility study and proposed plan for a record of decision. CDI has recently been awarded $700,000 additional funding through Pollution Prevention (P2).

Current Reporting Period Activities: A concrete coring unit was used to obtain samples to support the structural assessments and to determine whether potential contaminants had migrated beyond the confines of the process cells. The Remote Concrete Coring System, which consists of a Brokk 150N with a concrete coring attachment, was used for obtaining concrete samples in process cells 5, 6, 26, and 36 during a previous reporting period. Remaining samples were shipped for analysis during this reporting period and the results of the sampling have been received. The samples did not indicate significant migration of contaminants in the concrete.

Samples of sludge removed from the 24-inch drainpipe were obtained during a previous reporting period. The results of the samples were received during this reporting period. In addition, the liquid sampling of Tank 5-5, required to support the Sampling Plan, was completed. Discussions are continuing with regulators to ensure good communications during the development of the Phase III Feasibility Study and Proposed Plan.

For more information:

http://bhi-erc.com/canyon/canyon.htm

Tech ID 2178

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Highly Selective Nuclide Removal System—Accelerated Site Technology Deployment

Objective and Scope: In 1992, the last of the five U.S. Department of Energy production reactors at SRS was placed into shutdown mode, with no intention to restart. With this action, the site entered an extensive deactivation and long-term surveillance and maintenance life-cycle phase of these facilities. The integrity of the aging facilities has become a concern in recent years. Large volumes of contaminated water exist at some of these facilities at SRS (for example, fuel storage and disassembly basins). Treatment of this water requires removal of the water from the basin and shipment to the F and H Area Effluent Treatment Facility (ETF). A technology that is cost-effective and safe is needed to process the basin waters on location and selectively remove radioactive materials without transporting the water to ETF. The technology must reduce targeted nuclides to near DOE release limits and condition the water for direct release. Efforts to address these concerns have been initiated under the current funding for reactor monitoring and are being incorporated into the overall facility deactivation, decontamination, and decommissioning planning strategy. With the uncertainty of the

basin integrity over time, a technology that can remove radioactive contamination from the basin water while minimizing secondary waste generation is essential to the success of the deactivation of the DOE reactor basins. The SRS ASTD is deploying an innovative, highly effective water treatment system to remove selected radionuclides (both strontium and cesium) from millions of gallons of water. Overall, deactivation and decommissioning life-cycle costs are expected to significantly decrease via deployment of the technology.

Status and Accomplishments and Current Reporting Period Activities: Documentation on the 3M Selective Separation Cartridge, including a technology summary, advantages over the baseline technology, and summary of demonstrations and deployments, has been completed. The 3M Selective Separations Cartridges have special characteristics of high separation efficiencies, high nuclide loading, high flow rates, fast reaction kinetics, compact size with small footprint, and cost-effective treatment. Membranes have been developed for removal of cesium (Cs-137), technetium (Tc-99), strontium (Sr-90), cobalt, and lead. Major demonstrations include the ongoing demonstration/deployment (20 gpm) for removal of Cs-137 and Sr-90 from the 5-million gallon concrete lagoon at the Savannah River Site; the removal of Tc-99 from groundwater (1 gpm) at Paducah Gaseous Diffusion Plant; the removal of Sr-90 from tank wastewater (1.5 gpm) at Brookhaven National Laboratory; and the removal of Tc-99 from groundwater (10 gpm) at Ashtabula.

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Tech ID 2937

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Integrated Excavation Control System (IECS) (formerly Mobile Work Platform—Accelerated Site Technology Deployment

Objective and Scope: This ASTD involves a partnership between FEMP and INEEL to procure and deploy an excavator arm with real-time sensors affixed, allowing precision excavation of above-Waste Acceptance Criteria (WAC) materials and real-time precertification surveys in complex terrain. This new effort is a redirection of the Mobile Work Platform project. The IECS will address real needs at Fernald and other sites that require the complex excavation of radionuclide-contaminated soils during the below-grade deactivation and decommissioning of large structures.

Status and Accomplishments: Design of the IECS is underway and the equipment is being fabricated at INEEL.

Current Reporting Period Activities: No activity to report.

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Remote Size Reduction for Large Hot Cell Deactivation—Accelerated Site Technology Deployment

Objective and Scope: The 324 Building, located at the Hanford Site near Richland, Washington, is being deactivated to meet

state and federal cleanup commitments. The 324 Building has several highly radioactive tanks, tank vaults, piping, and large hot cells containing complex chemical processing equipment. To meet the cleanup commitments, there is a need to deploy more rapid and remote size-reduction, debris collection and removal, characterization, and decontamination methods. Readily deployable deactivation methods that reduce worker exposure, secondary waste generation, costs, and risks are also needed. Deployment of a remote/robot work platform in the 324 B-Cell with full reach capabilities will significantly accelerate work tasks, will eliminate the need for multiple, specialized tool design and procurement, and will reduce the overall program risks.

The Hanford Site ASTD project will fund the deployment of a robot work platform to support 324 B-Cell cleanup activities. Through this project, Hanford will procure and deploy a remote/robot work platform that is positioned with an overhead crane to perform deactivation activities. Following B-Cell cleanup, the work platform will be deployable for other 324 and Hanford site cleanup missions.

Status and Accomplishments: The contract with Cybernetix was modified to include fabrication of a special stand to allow the system to be placed in the airlock pipe trench for deactivation activities. These activities include cutting and plugging various size pipes, dismantling equipment, and removing sludge and other debris in the trench. The assembly, testing, and operator training for the system will be conducted at Hanford's 306E facility. DOE-RL and the State of Washington (Department of Ecology) are negotiating a change in Building 324 Deactivation milestones, which directly impact the deployment date of the work platform. System deployment is projected for the fourth quarter of FY2001.

Factory inspection of the remote/robotic work platform and certification of the system is complete. Factory acceptance testing is scheduled for February 2001 with the unit arriving at Hanford in March 2001. Plans are to train operators for up to a month followed by "hot" deployment of the system in the 324 facility.

Current Reporting Period Activities: No activity to report.

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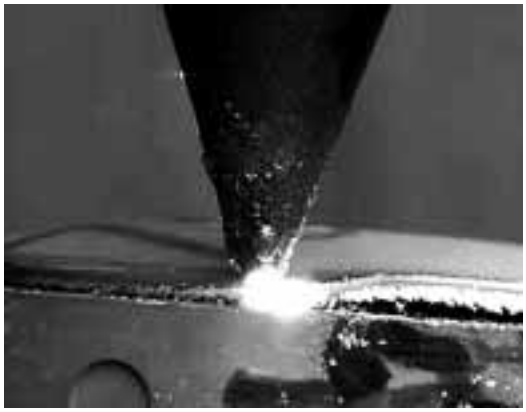
Oversize Transuranic (TRU) Waste Laser Cutting System—Accelerated Site Technology Deployment

Objective and Scope: DOE-Nevada has a need to size-reduce and characterize 58 oversized TRU-contaminated metal boxes (total volume of 270 cubic meters) prior to shipping them to the Waste Isolation Plant (WIPP). The Oversize Transuranic Waste Laser Cutting equipment from GSI-Lumonics is used to diminish the size of TRU waste to fit into WIPP containers. to Waste Isolation Pilot Plant (WIPP). The contents of these boxes are contaminated gloveboxes (32), a metal cutting lathe, lengths of metal piping, lengths of angle iron, and various scrap metals. The Hanford material requiring size reduction includes a minimum of 150 gloveboxes, as well as ductwork and piping. At Rocky Flats, the laser



The Oversize Transuranic Waste Laser Cutting equipment from GSI Lumonics is used in ASTD to diminish the size of TRU waste to fit into WIPP containers.

cutting system will also be applied to contaminated gloveboxes (150).

Status and Accomplishments: The pre-deployment of the laser cutting system at the Hazardous Materials Management and Emergency Response Training and Education Center, known as HAMMER, Richland, Washington, is anticipated in May 2001. This testing will involve cutting up many non-contaminated metal items including at least one glovebox, one standard waste box, and one tank. The testing plan is in preparation.

The procurement of the laser-light containment structure is expected soon. The containment structure will be shipped directly to Hanford in time to support the May installation of the laser cutting system for its pre-deployment at HAMMER. Full deployment of the TRU waste laser-cutting system at the LANL Decontamination and Volume Reduction System (DVRS) is expected during the spring of FY2002.

Current Reporting Period Activities: GSI-Lumonics continues testing of the trailer-mounted laser cutting system at their Minnesota facilities. They are integrating the robotic arms with the laser to complete the system. An acceptance checklist is being developed by LANL project team members for accepting the completed laser system from GSI-Lumonics. Acceptance is expected to occur in late April. The Phase IV procurement is essentially completed. It consists of the laser-light containment structure, remote monitoring cameras and monitors, light curtains, laser safety glass and other safety devices, and software. This equipment will be shipped directly to Hanford in time to support the May installation of the laser cutting system for the pre-deployment at HAMMER.

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Smart 3D Characterization of the Brookhaven Graphite Research Reactor (BGRR)—Accelerated Site Technology Deployment

Objective and Scope: The BGRR was a graphite-moderated and -reflected, air-cooled, thermal neutron research reactor that operated from 1950 to 1968. In 1997, following safe shutdown during the 1970s and 1980s, a site-wide review found radioactive water in the BGRR underground air-cooling ducts. Subsequently, it was determined that a comprehensive investigation of the environmental vulnerabilities and overall facility condition should be conducted. The first phase of this investigation involves characterization to support D&D planning of the BGRR facility including: the reactor building (701), reactor pile (702), fan house (704), instrument house (708) and canal house and outdoor pad (709). Characterization will also be needed to support waste disposal operations during decommissioning operations and to verify regulatory compliance following D&D operations.

DDFA supports the BGRR Decommissioning Project characterization effort through an Accelerated Site Technology Deployment (ASTD) project funded in September 2000. This ASTD project "Smart 3D Characterization," is also supported by the Subsurface Contaminants Focus Area and will deploy innovative characterization and sampling techniques coupled with 3D modeling capabilities to characterize soils and below-grade concrete ducts. These below-grade ducts (BGD) connected the reactor pile with filters and fans to enable cooling air to be drawn through and exhausted. The ducts consist of two separate plenums measuring 10 x 14 x 170 ft each. The ducts are known to have collected rainwater following shut down of the BGRR and are considered a potential source of subsurface soil contamination. If through thorough subsurface characterization the soil surrounding the ducts is not contaminated, it may be possible to leave all or portions of the BGD in place rather than removing them, resulting in significant savings in remediation of the Brookhaven site.

Status and Accomplishments and Current Reporting Period Activities: Efforts during the second quarter of FY2001

focused on the deployment of a suite of innovative technologies to characterize subsurface contaminants surrounding the BGD. The technologies deployed included a small footprint geoprobe to install monitoring ports and to obtain soil samples, a perfluorocarbon tracer (PFT) to identify potential leak pathways in the ducts, and an environmental visualization system (EVS) for modeling and three-dimensional display of tracer gas and soil characterization data.

A total of 1,385 PFT samples were taken and analysis using gas chromatography has been completed on the tracer gas. Review of the PFT data resulted in a decision that the analysis of the last round of 139 gas samples collected was not required. These data represented the decay of the gas concentration in the subsurface soil and would not provide any additional information about potential leak pathways. Of the remaining 1,246 PFT samples, 127 sample bags did not contain sufficient gas within the bags to be properly analyzed. This was due to difficulties in acquiring sufficient gas samples, or leakage in plastic sample bags or faulty valves. Thus, 1,119 data points were received for analysis of potential BGD leak pathways. The analytical gas tracer data has been entered into the EVS and data analysis is underway. To date, the PFT tracer gas study has identified areas of high, medium and low probability of leakage. Additionally, leakage has been detected primarily at the duct expansion joints and bustles.

A 3-D visualization output from the Environmental Visualization System, depicting the Below-Grade Ducts with simulated PFT leak data. Medium gray areas include higher concentrations of tracer gas (i.e., more leakage) and dark gray areas denote lower concentrations.

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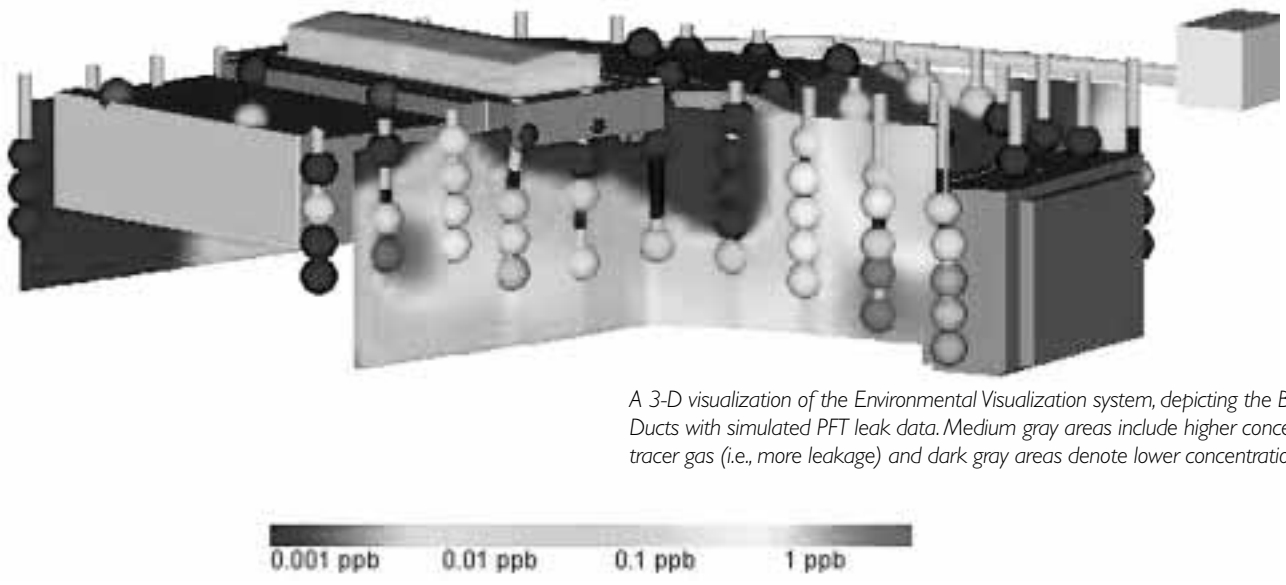
Rocky Flats D&D Initiative and Associated ASTD Projects

Objective and Scope: The Rocky Flats Site is on an aggressive, accelerated schedule to achieve clean up and "Closure" by the end of 2006. The baseline plan for the Rocky Flats Closure Project involves dispositioning over 900 contaminated gloveboxes, more than 450 production process tanks, thousands of feet of ventilation system piping, and miles of production process piping. In order to accomplish this challenging goal, Rocky Flats has incorporated into their baseline plan application of new and innovative technologies for characterization, decontamination, size reduction, and waste handling and packaging.



A 3-D visualization of the Environmental Visualization system, depicting the Below-Grade Ducts with simulated PFT leak data. Medium gray areas include higher concentrations of tracer gas (i.e., more leakage) and dark gray areas denote lower concentrations.

Status and Accomplishments:
A significant cost in the D&D of buildings at RFETS is the size reduction and packaging of plutonium-contaminated gloveboxes, tanks, and other equipment. DDFA is supporting the disposition of these systems through the Rocky Flats D&D Initiative (RFI), as well as Accelerated Site Technology Deployment (ASTD) projects including:

- Enhanced In Situ Decontamination and Size Reduction
- Remote Operated Size Reduction System
- Remote In Situ Size Reduction of Plutonium Gloveboxes
- Decontamination of Gloveboxes and Equipment without Size Reduction
- Upgrade Radiation Instruments
- Interbuilding Transfer of Plutonium Gloveboxes

All of these projects seek to identify and deploy proven, commercially available technologies and innovative systems that require only minimal modifications for the safe and cost-effective disposition of contaminated processing equipment and systems. The RFI serves to augment the ASTDs and to support problem-specific deployments not currently funded by an ASTD project such as the characterization and eventual removal of concrete-embedded equipment in Building 776.

Current Reporting Period Activities:

Enhanced In Situ Decontamination and Size Reduction—Rocky Flats is currently measuring TRU standard waste boxes using the Standard Waste Box (SWB) Counter, developed at LANL. WIPP certification of the SWB is pending review of the initial data packages collected during the WIPP audit in January. Rocky Flats expects full deployment of the SWB system during the third quarter of FY2001.

Installation and operation of the second generation Inner Tent Chamber (ITC) developed by S. A. Robotics, Loveland, Colorado, commenced in January 2001. This version of the ITC includes a manual cutting plasma arc tool and sealed-in operating area. The estimated throughput of the system is one glovebox per shift. The third generation of the ITC includes remote size reduction capabilities while maintaining the option of using manual size reduction methods, as well as remote handling and waste box loading of cut pieces. Deployment of the system is expected by early third quarter FY2001.

Remote Operated Size Reduction System (ROSRS)—Due primarily to the success of the Inner Tent Chambers at RFETS, a decision has been made not to deploy ROSRS. DOE-Rocky Flats and EM-50 are currently soliciting complex-wide interest in deploying ROSRS. Potential candidates include Savannah River and Hanford.

Remote In Situ Size Reduction of Plutonium Gloveboxes—A contract has been awarded to RedZone Robotics for the in situ decommissioning of the high external-exposure glovebox lines in Building 771. They have completed the final negotiations with RedZone Robotics and engineering of the containment, off-gas systems, and building work process is underway. Delivery of the system is scheduled for August 2001. The Remote In Situ Size Reduction System (ISSRS) will be used to size reduce and package large oversized gloveboxes and other contaminated equipment in Building 771 that cannot be transferred to a centralized size reduction facility.

Decontamination of Gloveboxes and Equipment without Size Reduction—This project supports the deployment of a suite of decontamination technologies to allow shipment and disposal of plutonium-contaminated gloveboxes, tanks, and other equipment while obviating size reduction requirements. By reducing surface contamination, this equipment can be disposed of as LLW, thus minimizing the total waste volume of material to be shipped to WIPP.

Cold testing for the cerium nitrate steam injection has started and the decontamination of the first eight hot tanks is scheduled for April. Contracts for the deployment of chemical decontamination, vacuum grit blasting, vacuum carbon dioxide decontamination, and the SEA Pipe Explorer system have been awarded. The Request for Proposals (RFP) for dry sludge removal will be issued in April 2001. The majority of the work will be completed between July and September 2001.

Upgrade Radiation Instruments—This project supports the deployment of a suite of state-of-the-art instrumentation and data collection systems required for compliance with radiation control, release limits, and control/tracking of waste. Procurements for high-resolution portable neutron-gamma systems and building characterization data loggers, and certification of a large-area final building survey monitor have been completed. A mobile data integration system for residue processing is ongoing, with systems completed for ash and wet residues (see October through December 2000 DDFA Quarterly Update). Work is under-way on systems for fluoride residues and D&D waste.

Interbuilding Transfer of Plutonium Gloveboxes—This project was first funded in December 2000 and there are no current activities to report at this time. The purpose of this project is to design, fabricate, and install a remote system for the on-site transfer of contaminated gloveboxes and other processing equipment to a centralized size reduction and packaging facility. The system will consist of a Standard Transport On-Site Management Package (STOMP) and Sealed Building Penetration Chambers. The system is expected to optimize size reduction and packaging activities on site, thus increasing productivity and D&D schedules. Though Kaiser-Hill still plans to procure an Interbuilding Transfer System, final decisions regarding ROSRS have delayed design and fabrication of the system.

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▼Diamond Wire Saw Demolition and Size Reduction of a Reactor Bioshield—Accelerated Site Technology Deployment

Objective and Scope: The Columbus Environmental Management Project was awarded an ASTD project to deploy a diamond wire saw system to size reduce

Diamond Wire Saw

an activated bioshield and associated structures in a decommissioned research reactor at Battelle's West Jefferson site in Columbus, Ohio. The bioshield is made of high-density concrete approximately eight feet thick with an extensive internal latticework of carbon steel reinforcement bars. This technology was used successfully in decommissioning projects at Fort St. Vrain and Shoreham Nuclear Power Plants, but has seen little application within DOE's decommissioning projects. The estimated cost to size reduce the Building JN-3 bioshield at West Jefferson is $780,000 using the diamond wire saw compared to an estimated cost to dismantle the bioshield with the baseline technology of heavy jackhammers at $1,051,000. Thus, size reduction using the diamond wire saw represents a cost saving of about 25 percent compared to the baseline approach. Subsequent deployments of the diamond wire saw are planned for Mound and West Valley.

Status and Accomplishments: The final report for the Diamond Wire Saw deployment at Battelle's West Jefferson site will be ready in early April. Estimated cost using the diamond wire saw is $270,000 less than using a Brokk concrete demolition machine with a jack hammer.

Current Reporting Period Activities: All size reduction of the bioshield and associated structures was completed in early March.

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Reducing, Reusing, and Recycling Concrete and Segmenting Plate Steel and Tanks Utilizing a Universal Demolition Processor—Accelerated Site Technology Deployment

Objective and Scope: As decontamination and decommissioning work at Fernald progresses from above-grade facilities to at-grade and below-grade facilities, there will be a bona fide need for new technologies to process concrete. Fernald can realize significant cost savings by reprocessing and reusing a portion of the site's concrete. There is a defined need for aggregate to build and strengthen the site's transportation infrastructure in and around the On-Site Disposal Facility (OSDF). Project personnel in the Soils and Water Division have an estimated need for up to 15,000 cubic yards of aggregate per year, for the next six years. Not recycling the site's concrete means that tons of aggregate will have to be trucked in from offsite and subsequently disposed in the OSDF. Reprocessing a portion of the concrete saves the costs associated with the purchase of virgin aggregate and its subsequent disposal cost. The site can also realize increases in safety, efficiency, and schedule by using the plate shear capability of the universal processor. Fernald has numerous large, heavy steel tanks including two water towers and numerous tanks made of stainless steel.

Through the activities in this project, innovative technologies will be deployed to accelerate demolition/recycling of construction materials for road construction, and for segmenting large, hard to cut, plate steel and tanks. Overall, decommissioning life-cycle costs are expected to significantly decrease via the deployment of these technologies.

Status and Accomplishments: Field work is targeted to begin in April and will involve four locations: 20H-Water Tank pad, 20C-Cooling Tower pad, 19D-Old North Tank Farm, and 10D-Burn Pad Building. These four locations total about 1,200 cubic yards of concrete. Three of the locations are easily assessable, but one location (10D) is a clean concrete pad (above WAC) while the soil below it is contaminated. The challenge is to remove the concrete and process it as aggregate for use at the On-Site Disposal Facility without disturbing the soil underneath.

Current Reporting Period Activities: The Universal Demolition Processor arrived on the Fernald site by the end of March 2001. They plan to install it on the John Deere 450 excavator in April.

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Improved Measurement and Monitoring Systems—Accelerated Site Technology Deployment

Objective and Scope: The Fernald Environmental Management Project (FEMP) is a 1,050-acre DOE Closure Site currently undergoing decommissioning and environmental restoration. As environmental cleanup work at the FEMP accelerates towards closure and long-term stewardship, there is an increasing need for new, innovative technologies to perform real-time physiological monitoring, land surveying, and wireless radon monitoring. In the process of deactivating and decommissioning DOE facilities, individual laborers sometimes need to work in/near radiological and hazardous locations, and in situations that lead to extreme physical conditions. At FEMP, these types of extreme conditions will likely occur in the upcoming FEMP Silos project and in other restoration projects across the site. Technologies are needed that reduce workers' risk during engineering, construction, and environmental restoration operations. To minimize these risks, three new technologies have been identified for deployment at FEMP. Collectively, these technologies will provide for the monitoring of worker vital signs, improved land surveying, and the remote transmission of radon monitoring data.

Status and Accomplishments: The RTPMS technology arrived on site so the

Fernald project team could conduct the needed validation of complete data transmission for worker safety. The RPTS technology is being held in abeyance at the time due to the limiting factor of the weather. The wireless radon monitoring system has initially been set up with a temporary base station. The communication back to the temporary base station has been checked for noise and transmission level and everything appears to be fine.

Current Reporting Period Activities: On March 7, 2001, as part of a NETL DDFA-sponsored ASTD, the Fluor Fernald Survey and CADD team and Technology Program group deployed the Leica Prismless Survey Total Station. The Prismless Survey Total Station (PSTS) enables a single surveyor to perform tasks that normally require a crew of two or three workers. The PSTS was used to survey the height, elevation, and contour of "as built" areas within the On-Site Disposal Facility gravel lay down area. The PSTS allowed the surveyor to perform this survey without assistance and to perform only one station setup, as opposed to three times with previous equipment. The surveyor was able to do this because the PSTS has a coaxial automatic target recognition system, which will recognize the target (prism) automatically. There is also a mobile control panel (attached to the prism pole) that has exactly the same display/input as the PSTS panel for ease of operation. Data collection time was reduced by half; that is, from about 1 hour to around 30 minutes by using the PSTS.

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Intrusive and Non-Intrusive Characterization through Concrete Walls and Floors—Accelerated Site Technology Deployment

Objective and Scope: In mid-FY2000, the Miamisburg Environmental Management Project was awarded an ASTD project to ascertain the nature and extent of contamination in an area under SW Building known as the "Old Cave." The Old Cave is actually the entombed remains of a 1950's hot cell, which must be removed before the City of Miamisburg, Ohio, will accept ownership of the Mound site. In SW Building, the Old Cave is located under an area designated SW-19. Because of lack of knowledge of what is in the Old Cave area, ultra conservative estimates of the amounts of Ac-227 and Ra-226 have been made which required the Old Cave to be classified as a Category 2 Nuclear Facility. It is considered highly unlikely that that much radioactive material resides in the Old Cave. The approach is to characterize SW-19, the surroundings, and the entombment. In Phase I—Non-Invasive Investigations, they plan to characterize the entombment using ground penetrating radar and time-domain electromagnetic, gamma spectrometry, drain exploration, and radon monitoring. In Phase II - Invasive Investigations, they plan to perform these investigations with respect to the entombment via diamond core drilling and/or Geoprobe with a real-time position location determination device. Once better defined radioactivity levels are determined, and a final design decision to the Baseline Plan is made, several enhancements that shorten the schedule and reduce costs may result. A baseline recovery of only one week would recoup the entire ASTD investment. If the baseline acceleration is greater than the one week, the return on investment will increase proportionally as additional weeks/months are saved from the baseline. Based on the Value Engineering study, it is conservatively estimated that four months can easily be recovered when compared to the present technical approach.

Status and Accomplishments: The Phase I— Non-Intrusive Characterization

Process Summary Report was completed in November. During Phase I, non-invasive measurements were obtained using the following technologies: 1) ground-penetrating radar, 2) electromagnetic ground conductivity, 3) gradient magnetics, and 4) gamma spectroscopy. This characterization was to locate objects or structures buried within the entombment and to define the nature and extent of contamination. The best geophysical information was gathered from the topside of the entombment by electromagnetic surveying. Gamma spectroscopy measurements demonstrated evidence of both Ac-227 and Ra-226 contamination in many areas. Thorium-232 and cesium-137 were also indicated. In addition, uranium-238 and cobalt-60 were identified on the surface in a few specific areas. These measurements indicate that radioactive soil contamination is present beneath the floors in the rooms adjacent to the entombment. Contamination appears to be present within the walls around the entombment, as measured from adjacent rooms. Measurements from directly above the old process area indicate that contamination has migrated into the concrete cap. The gamma spectroscopy survey successfully identified and mapped the locations of subsurface radionuclides in the area, but was unable to quantify activity levels.

Current Reporting Period Activities: The Old Cave project team has started making use of the Subsurface Contaminants Focus Area's Innovative Treatment Remediation Demonstration (ITRD) group to facilitate the development of a Sampling Plan for the area under and around the R/SW Building complex (area containing the Old Cave entombment). Once the Sampling Plan is approved (mid-late FY2001), it is expected that actual Phase II Intrusive sampling will commence. The Old Cave team also continues to utilize an EM-50 developed technology, In Situ Object Counting System (ISOCS) gamma spectroscopy, not only to conduct characterization measurements around and above the Old Cave entombment, but also to do modeling of a waste bucket to support the planned waste characterization for shipping the Old Cave wastes containing Ac-227 and Ra-226 to the Nevada Test Site (NTS). The team is also working with the NTS in developing a waste sampling/characterization plan. Also, Rocky Flats has requested a copy of the Phase I Non-Intrusive Characterization Report and is also interested in the Old Cave planned excavation process. Rocky Flats has a similar type of project where they have a 20 feet by 20 feet RAD room with a 10-foot ceiling height (Building 776) that has equipment and miscellaneous items that are buried in concrete, with similar radiological conditions. The project team will continue to collaborate with Rocky Flats as the project progresses.

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MARSSIM Innovative Characterization at Nevada—Deployment

Objective and Scope: While portions of the MARSSIM methodology have been used at the Nevada Test Site (NTS) and other EM sites, typically, the methodology has been used to characterize and/or release 2-D surfaces (interior of buildings) and surface soil. There has been no systematic application of MARSSIM for subsurface soil investigation characterization or exterior building and roof verification surveys. The NTS deployment of MARSSIM will concentrate on non-standard applications where there are potential cost savings when compared to the NTS baseline methodologies.

In addition to the MARSSIM surveys, there is an immediate need to develop more cost-effective waste characterization methodologies. The baseline NTS waste characterization methodology requires a minimum of five samples to be collected from each B-25 box.

This ASTD project will apply MARSSIM for non-standard applications including implementation (and development) of a 3-D statistical approach for characterizing subsurface soil. The results of this effort will be to reduce the number of sampling locations and/or an increase in the confidence of the subsurface characterization data. The MARSSIM methodology will also be deployed for building roof top and building exterior release surveys, to reduce the necessity of using the baseline instrument surveys that are now required for the site release of each individual waste load.

In addition to deploying the potentially cost reducing MARSSIM methodology, Brookhaven National Laboratory will provide technical assistance for the deployment of In Situ Object Counting System (ISOCS) deployment. The ISOCS deployment will focus primarily on waste characterization, but it will also be deployed as an integrated technology as part of the MARSSIM roof top survey. By deploying the ISOCS system and applying isotope scaling factors developed from characterization sample results, real-time waste characterization of B-25 boxes and 55-gallon drums can be accomplished. Other technologies such as the Gamma Detector Instrumented Cone Penetrometer (CPT) will also be deployed as part of the MARSSIM survey and modeling effort for subsurface soils.

Status and Accomplishments and Current Reporting Period Activities: This project was first funded in December 2000. During the reporting period, personnel from Brookhaven National Laboratory visited the NTS to assist in preparation of the MARSSIM survey design, which is expected to be completed in April 2001. Field implementation of the MARSSIM survey and deployment of the innovative technologies is expected to be completed by September 2001.

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Contaminated Large Equipment—Accelerated Site Technology Deployment

Objective and Scope: The Savannah River Site has identified over 600,000 cubic feet of radiologically contaminated large equipment (CLE) requiring disposition. This is representative of a much larger quantity than anticipated as the site proceeds into more D&D. DOE Order 435.1 will elevate regulatory attention and surveillance impacts for this stored material with significant cost increase for deferring permanent disposition. Disposal of this material "as is" would consume the SRS waste disposal capacity, be cost prohibitive, and waste DOE assets.

SRS proposes to procure the following equipment to augment existing infrastructure and to facilitate the size reduction and decontamination of CLE:

- Large-span PermaCon Hut for containment
- Robotic/remote operated shears
- Robotic/remote operated plasma arc cutting system
- Robotic decontamination system

The above-proposed approach capitalizes on the remote-operation technologies and equipment to minimize health and environmental risks as well as accelerating cleanup at a reduced cost while meeting project objectives. This equipment will be used in conjunction with the SRS Decontamination Center to provide capabilities for disposition of large equipment and to support on going routine decontamination work.

Status and Accomplishments and Current Reporting Period Activities: No activity to report.

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Deployment of Improved Technologies for Cleanout of the F-Reactor Fuel Storage Basin — Accelerated Technology Site Deployment

Objective and Scope: Cleanout of the F-Reactor Fuel Storage Basin (FSB) is a key step in completing the Paths to Closure for the Hanford Site. The F-Reactor FSB has some complex technical issues and unique challenges, including identification, removal, and disposal of miscellaneous irradiated/contaminated debris that is potentially interspersed with pieces of spent fuel elements buried under 6.1 m (20 ft) of sandy soil. Broadly, the technical needs associated with the project include 1) characterization, 2) backfill removal and segregation, and 3) material removal and segregation.

History and preliminary characterization information indicate that the top 5.2 m (17 ft.) of fill should be free of radiological or chemical contamination, and that most of the debris is expected to be found primarily in the bottom 15% of the basin.

Status and Accomplishments: The regulatory documentation, conceptual engineering, and planning for F Reactor FSB D&D were initiated in October 1999. Characterization planning, regulatory approvals, and definitive engineering were completed in FY2000. Preparation of equipment specifications and purchasing was initiated in FY2000 allowing for technology deployments in the second quarter of FY2001.

It is anticipated that funding will be directed to the contractor via contract modification by the end of April 2001. The F-Reactor FSB D&D work activities should be complete at the end of FY2001.

Current Reporting Period Activities: Phase one of the F Reactor FSB Cleanout Project has been completed. This includes the removal of the above-grade structure and the excavation ofbackfill, concrete beams, and concrete columns down approximately 17 feet.

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Deactivation & Decommissioning (D&D) Consortium

Objective and Scope: In December 1997, DOE signed a Memorandum of Understanding (MOU) with the Electric Power Research Institute (EPRI) and several nuclear utilities to jointly develop and deploy new D&D technologies. DOE's objective is to expand the reach of benefits of the "leading-edge" technologies being deployed within the DOE nuclear complex. The MOU Consortium established a charter in early 1998 and identified challenging technological areas common to both DOE and the commercial industry. Both DOE and commercial sites will be used for these demonstrations and deployments.

DOE and EPRI are collaborating to conduct quarterly workshops at various nuclear plants around the country, each focusing on a particular decommissioning area. DOE and the utilities present the most recent, innovative technologies to improve productivity and worker safety while reducing cost. The workshops will solicit feedback from hands-on plant managers and field workers. Topics covered to date address low-level waste disposal, concrete decontamination, imbedded pipe decontamination, and site characterization.

Status and Accomplishments: The first technology demonstration resulting from the DOE/EPRI/Utility Consortium was completed at the Rancho Seco Nuclear Power Plant.

The first technology demonstration involved the concrete shaving technology developed by Marcrist Industries, Ltd. Two separate pieces of equipment were

demonstrated. Both used a diamond-impregnated shaving drum as the cutting tool for removal of the concrete surface. Generated dust was collected by a vacuum system and deposited in a waste drum.

The first piece of equipment was a self-propelled, electric powered floor shaver. It was demonstrated on clean and radioactively contaminated floor areas in the reactor turbine building. Several parameters were recorded as part of the demonstration and the technology was well accepted by the operating staff.

The second piece was a hydraulically powered wall-shaving unit. For purposes of the demonstration, the unit was mounted on a forklift.

Current Reporting Period Activities: Members of the D&D Focus Area team met with the Decommissioning Manager at Rancho Seco in October 2000 and discussed future plans for NETL support of the MOU and the Sacramento Municipal Utility District (SMUD) level of interest in future demonstrations of innovative technologies at Rancho Seco. The team met again with the Rancho Seco staff during February 2001 to further discuss potential deployments at the facility under the MOU and with Florida International University.

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Florida International University

Objective and Scope: The Hemispheric Center for Environmental Technology (HCET) at Florida International University, is working on several D&D related research projects under a grant awarded by the DOE Office of Science and Technology. These FY 2001 projects include:

- Deactivation and Decommissioning Technology Assessment Program
- Technology Information Management and Dissemination
- Technology Development, Integration, and Deployment Program
- Worker Health and Safety Research and Technology Development
- D&D Waste Disposition and Treatment
- Long-term Monitoring and Stewardship for DDFA

Status and Accomplishments: Under this project and earlier technology assessment projects funded from other sources, FIU-HCET has assessed over 80 baseline and innovative technologies for deactivation and decommissioning application under standardized, non-nuclear testing conditions.

Current Reporting Period Activities:

Technology Assessment Program:

Two further facility dismantlement technologies for building materials have been identified.

- Emerging Construction Technologies: Soundless Chemical Demolition Agents
- Demolition Technologies Incorporated: BRISTAR demolition agent

The University of Tennessee has performed a PS-11 statistical analysis using the initial EPA Reference Method 5i results that were provided by Airtech. The analysis indicated that only one of the three PM CEMs evaluated the ESA instrument, was successful.

D&D Technology Information Management and Dissemination:

- Several databases have been completed/ updated including the Worker Safety and Health, Vendor Information, and knowledge base.
- The Worker Health and Safety database has been developed.
- Vendors were contacted requesting new catalogs and updated information in order to get new technologies.

Technology Development, Integration, and Deployment Program:

As part of the Technology Development and Integration Program, two thermal and two mechanical technologies have been down-selected as the appropriate candidates for modifications by assessing demonstration experiences at FIU-HCET and throughout the DOE complex. The down-selection process looked at the technology's life expectancy,

end point of cut achieved, secondary waste generation and classification, ease of decontamination, performance data, and technology specifications (utilities, dimensions, etc.) The technologies selected are the Oxy-Gasoline Torch, Plasma Arc Torch, shears, and a high-speed band saw.

Worker Health and Safety Research and Technology Development:

A set of experiments with plasma torch cutting steel, stainless steel, and aluminum plates of various thicknesses was completed.

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▼International Agreement with AEA Technology

Objective and Scope: Through an International Agreement, DDFA has engaged AEA Technology to use their knowledge and expertise to address specific deactivation and decommissioning problems throughout the DOE weapons complex. In FY2001, AEA will support the following four projects, which emphasize the transfer of proven, innovative technologies from the United Kingdom and Europe to the DOE complex:

Status and Accomplishments and Current Reporting Period Activities:

Accessing & Sampling the Retention Basin at the INEEL Test Reactor Area

The retention basin at the TRA facility in INEEL is a below-grade concrete settling tank some 128 feet long, 40 feet wide and 15 feet deep. Originally built in 1961, the facility was used to settle the heavier wastes that were generated in the facility allowing the lighter liquid to flow through to the evaporation pond. In 1972, it was established that the basin was leaking and that the inflow of liquid into the retention basin was less than the leakage out of the basin. The basin was then removed from service.

It is estimated that between one to three feet of sludge remain unevenly distributed across the base of the tank. Under the voluntary consent order, signed between INEEL and the State of Idaho, the retention basin is due to be emptied and closed. As the first step in the eventual removal of the tank from the ground, AEA will work with site engineers to establish the best methods of gaining entry to the basin for sampling, inspection, and retrieval of the sludge. The outcome of this initial investigation will be the development of an option study and final report outlining the optimal decommissioning approach for sampling and retrieval. AEA hopes to deploy an improved system based on this assessment in FY2002.

Deployment of an ARTISAN™ Manipulator for Debris Retrieval from a Hot Cell Facility at the Columbus Environmental Management Project

The CEMP is currently decontaminating affected buildings and grounds in order to return these facilities to the owner in a condition suitable for use without radiological restrictions. A major challenge currently facing the site is the size reduction, decontamination, and removal of debris from hot cells. The cells contain a variety of materials including tables, steel plates, tools, and lighting fixtures. The Master Slave Manipulators (MSMs) currently in the cells are not capable of performing the required tasks of size reduction and waste packaging. The facility managers have expressed a need for a robust manipulator capable of performing the tasks required.

AEA Technology will provide a hydraulic manipulator mounted on a mobile platform that will be capable of performing the tasks identified by CEMP representatives in each of the cells. The manipulator, an ARTISAN™, has been deployed throughout Europe to perform tasks similar to those described. AEA Technology will also provide training for CEMP operators as well as the necessary documentation required for operations and maintenance of the ARTISAN™ arm. The existing manipulators have a very limited load capacity (25 lb.), cannot reach the cell corners, and cannot withstand significant vibration. Therefore, to perform gross decontamination and cleaning, alternative remote

technologies such as the ARTISAN™ Manipulator Arm (with a 1000 lbs. load capacity and extended reach) must be used for these activities. This deployment will save significant time, labor, and potential worker dose compared to using conventional manipulators with the existing crane in a more hands-on operation. The ARTISAN™ Manipulator Arm has been shipped from the United Kingdom to AEA's facility in Pittsburgh, Pennsylvania. Deployment at CEMP is currently planned for May/June 2001.

Removal of Waste from the WD Complex at Mound

Building WD is a multi-story facility used for the treatment of low specific activity (LSA) radioactive wastes generated by process activities at Mound. The contaminated facility is 28,800 square feet and has exterior walls of reinforced concrete and concrete block. The roof is concrete slab. As the first step in the D&D of the facility, 33 waste tanks, and other miscellaneous vessels must be emptied and removed. AEA Technology will assist Mound in determining the optimal approach for gaining entry into the tanks to allow sampling, inspection, and retrieval. AEA will transfer a small tank mixing system from Oak Ridge to Mound in April 2001 and begin retrieval testing on two tanks beginning in May.

Deployment of a Hydraulic Manipulator for Hot Cell Decommissioning in Building 324 at Hanford

The 324 Facility supported radiological/ radio-metallurgical and waste vitrification research activities since the mid-1960's, and is now undergoing deactivation. The facility contains large radiological hot cells and tank vaults that are highly contaminated with radioactive materials and currently contain large, complex equipment. The 324 Facility is planned to be deactivated by 2006, and fully decommissioned by 2012.

Baseline deactivation activities in the 324 Facility use the existing inventory of mechanical Master-Slave Manipulators (MSMs). These MSMs were originally installed to perform the lighter-duty tasks associated with hot cell research studies. The MSMs have a maximum load capacity of 100 lbs. (45.5 kg) when in a vertical configuration, and only about 20-30 pounds when horizontally extended to 10 feet. The increased physical demands of facility deactivation often exceed intended design and lifting capacity of the MSMs. This has resulted in a significant increase in mechanical failures, and increased radiological exposure to operations and maintenance personnel with some MSMs failing as often as once a week (or more) depending on in-cell activities. The MSMs failures result in lost operational time, increased radiological exposure to personnel and amplified cost, as it takes significant resources to maintain and repair existing MSMs.

AEA Technology will provide a more robust, tele-operated hydraulic ARTISAN™ manipulator system that has a greater reach and higher payload capacity at full extension than the baseline MSMs. The ARTISAN™ will be assembled to the specifications provided by the 324 Facility personnel, and will be capable of being deployed through the 324 hot cells' standard 10" (25.4 cm) manipulator ports, with the option of configuration to a mobile platform, if required. This hydraulic manipulator system will provide the ability to handle waste materials, deploy size reduction tooling, assist with inspection and assessments of radiological hot cells, and provide the ability to deploy radiological decontamination tooling for the 324 facility hot cells and tanks. Manufacture of the ARTISAN™ is underway with an expected delivery date to Hanford of September 2001.

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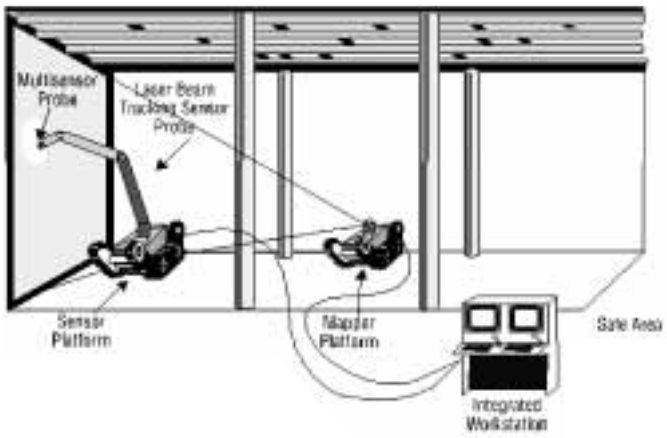
2.2 Facility Characterization

Three-Dimensional Integrated Characterization and Archiving System (3D-ICAS)

Objective and Scope: Coleman Research Corporation (Coleman) will develop a remote system that can rapidly analyze in situ hazardous organic and radionuclide contaminants on structural materials. This remote system is the Three-Dimensional Integrated Characterization and Archiving System (3D-ICAS). The 3D-ICAS consists of a mobile sensor platform and a mobile mapper platform that operate in contaminated areas, and an integrated workstation that remains in a safe location. Development of this technology will occur in three phases.

Status and Accomplishments: The 3D-ICAS was successfully integrated with mobile platforms at Oak Ridge National Laboratory. The Coherent Laser Radar Mapper was operated on the OmniMate robotic platform, and the contaminant analysis units and robot arm carrying the multisensor probe head were integrated on the overhead transporter. The system was subsequently demonstrated at Oak Ridge National Laboratory's Robotics and Process Systems Division in October 1998. The demonstration was conducted in the hi-bay area using a wall unit specially constructed for the demonstration. The wall unit consisted of pieces of cement-based wallboard and a small piece of an asbestos-containing material. The wall unit was purposely contaminated with low-levels of organic materials, alpha emitters, and a beta emitter. The demonstration consisted of mapping the wall unit, displaying the map, selecting the points to be surveyed, and running the contaminant survey. The survey required moving the sensor/analysis unit with the transporter, acquiring the sensor unit with the 3D mapper, displaying the measured contamination in real time, and displaying detailed spatial and contamination data after the survey was completed. An unfortunate hardware failure the day before the demonstration prohibited acquisition of contaminant data from the high-speed gas chromatography/mass spectrometry (HSGC/MS). Only the Molecular Vibrational Spectrometer (MVS) provided real-time identification of the substrate material during the demonstration. This was a significant success since the MVS correctly identified the wallboard as being cement, although the particular substrate sample had not been included in the system's neural network training set. Failure of the HSGC/MS was unfortunate, but its performance had been well documented and demonstrated before the demonstration at ORNL. The failure did not detract from the main objective of the demonstration, which was to show end-to-end system operation with the 3D-ICAS mounted on ORNL mobile platforms. The GC/MS was shipped back to Thermedics, parts were replaced, and the system was recalibrated.



Current Reporting Period Activities: The contractor has completed preparations for the final integrated testing of the 3D-ICAS, which will be performed at their facility in Boston. After completion of the final integrated testing, the system will be tested at Florida International University's mockup facility. Validation testing is scheduled to be conducted at FIU from May 14–18. CRC will submit the Draft Final Report June 15 and the Final Report will be submitted August 15. This project is expected to be completed by the end of FY2001.

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Tech ID 97

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Fast Response Isotopic Alpha Continuous Emissions Monitor

Objective and Scope: The objective of this effort is to develop and test Continuous Air and Emission Monitoring (CAEM) instrumentation for alpha-emitting radionuclides. This instrument will be designed in order to certify the proper performance of airborne emissions from ambient air and in equipment emissions encountered during D&D of DOE's surplus facilities. The proposed system will also meet the DOE's alpha CAEM requirements through the development of an innovative, high-resolution, on-line air/gas alpha monitor. The instruments will be capable of operating as a stack emissions monitor, as a process control instrument, or for the control of off-gas from decontamination, dismantlement, and air handling equipment.

Initial efforts will be focused on the development and evaluation of a rapid alpha-counting-based instrument to monitor ambient air and emissions to meet the monitoring and equipment control needs of surplus facilities undergoing decontamination and decommissioning. This development will establish the feasibility of a prototype instrument for use in detecting radionuclides that are present or that will create susceptibility to exposure throughout the DOE complex. The prototype instrument will be tested under the supervision of DOE's Inhalation Toxicology Research Institute in Albuquerque, New Mexico. Based on the prototype results, efforts may be continued toproduce a full-scale commercial prototype that will then be demonstrated in one of DDFA's LSDDPs.

This project is a two-phase developmental effort. Phase I involves the design, development, and preliminary testing of a laboratory-scale instrument. Testing will initially be conducted using naturally occurring radon progeny in ambient air. If the optional Phase II is exercised, the Phase I instrument will be critically evaluated at the Lovelace Respiratory Research Institute (LRRI) with characterized plutonium aerosols. Then an improved instrument will be built and field-tested at a suitable DOE site.

Status and Accomplishments: Informal meetings were held with various DOE CAEM end users. The personnel associated with LANL's upgrade of their continuous air monitoring system for the Plutonium Facility at Technical Area 55 (TA-55) are very interested in the further development of the Fast-Response CAEM. LANL is interested in hosting the Phase II field-test at the LANL TA-54 LSDDP.

Current Reporting Period Activities: Thermo Technologies no longer exists since being taken over by Maytag. The contract has been closed out and a final report was accepted as is. NETL has transferred the air monitor to the LANL ESH group. It will be utilized at their radioactive liquid waste treatment facility to detect residual alpha in treated water before its discharge.

The result from this project was the development of an initial prototype and advanced prototype instruments, all of which were tested under lab conditions. This was documented in the contractor's final report.

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Tech ID 2225

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Technology for Real-Time Measurement of Surface and Airborne Beryllium

Objective and Scope: The objective of this contract is to develop, test, and demonstrate an innovative real-time monitor for surface and airborne beryllium. This field-portable device is based on Laser-Induced Breakdown Spectroscopy (LIBS) and will be applicable to continuous air monitoring; field analysis of filters from personal air monitors, and analysis of surface wipe samples. Another potential application is a point and shoot device for direct measurement of beryllium on a surface. Accurate and timely detection, and monitoring of beryllium is critical to worker safety during deactivation and decommissioning activities. Beryllium dust is a significant

workplace hazard. Exposure to beryllium particles can cause a serious illness in certain people. This illness is chronic beryllium disease, or CBD-an irreversible and sometimes fatal scarring of the lungs. Beryllium metal has been produced for various industrial uses and has been widely used in aerospace and defense applications. The baseline method for beryllium analysis is sending samples to an off-site laboratory, which may require days or weeks to obtain results. The Rocky Flats Environmental Technology Center (RFETS), Oak Ridge, Y-12, LANL, and the DOD have beryllium issues.

Status and Accomplishments: On September 30, 2000, a contract was awarded to Science Engineering and Associates (SEA) to develop a technology for Real-Time Measurement of Airborne and Surface Beryllium. The contractor has been working to establish lines of communication with RFETS, where demonstration of the instrument is planned. Following minor revisions to the Scope of Work, a subcontract was issued to Lovelace Respiratory Research Institute (LRRI). Under this subcontract LRRI will prepare various beryllium on filter samples for SEA, provide laboratory space at the LRRI facility for SEA's to conduct LIBS measurements of beryllium filters, and provide consultation related to the design of the beryllium monitor. The SEA design staff held its first design meeting where the conceptual design for the prototype monitor was defined. Slight refinements to the conceptual instrument design were made to incorporate the input from the Rocky Flats technical contacts.

Current Reporting Period Activities: A conference call was conducted in February to discuss changes to the conceptual design for the real-time beryllium. These changes are in response to technical input from DOE and its support contractors; Rocky Flats, Characterization, Monitoring, and Sensor Technology (CMST) Crosscut Program; DDFA; and other EM-related personnel with expertise and experience in instrumentation and field measurements. Major design issues under consideration include humidity (dew point temperature) specification for instrument, hand-held module for direct surface analysis, early alarm mode (prior to measurement update reading), and interlocks for laser safety. Fabrication of a LIBS hardware set to conduct analysis of beryllium-loaded filter media has been completed and integration of the Chromsoft software, which operates the spectrometer and CCD detector, has been initiated.

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2.3 Facility Decontamination

High Productivity Vacuum Blasting System

Objective and Scope: The objective of this project is to improve the productivity and economy of existing vacuum blasting technology, which is used to remove radioactive contamination, PCBs, and lead-based paint while providing worker protection through continuously recycling of the material and dust from the decontamination tasks. This project will focus on re-designing and improving existing vacuum blasting components, including blast head nozzles, ergonomic handling of the blast head by reducing its weight, brush-ring design, vacuum level regulator, efficiency of dust separator, and operational control sensors. The redesign is expected to enhance the productivity and economy of the vacuum blasting system by at least 50 percent of current vacuum blasting systems.

LTC Americas will develop the necessary mathematical models of air-particle flow in the nozzle, in the blast head and interface area, and in the dust separator to study the flow characteristics and interaction of the various elements of the system. The purpose of this model development is to increase the productivity and economy of existing vacuum blasting technology by 50 percent. Based on the results of this modeling effort, the contractor will test the system and verify that the above system components perform according to the mathematical simulations. The contractor will then complete the preliminary design of the components of the proposed system. This will include an over-all configuration of the system, including material selection and testing, definition of the range of dimensional and weight parameters, and conceptual arrangement or design of the blast head unit and dust separator unit. Based on the preliminary design, the contractor will procure components and perform fabrication and assembly of the proposed system.

The performance of the system will be evaluated in the laboratory mock-ups representing various cleanup situations and environments. The contractor will review, analyze, and interpret data collected from the tests and develop a productivity enhancement profile of the pre-prototype unit including economic analysis. Based on the laboratory test results, the contractor will modify, change, and make adjustments to enhance the capability of the system.

Status and Accomplishments: Phase I has been completed. In Phase I, mathematical models and related code were developed to simulate the entire process numerically. Based on the date from the model, an innovative rectangular nozzle and a new centrifugal separator were designed, manufactured, and tested. The tests were performed to verify the mathematical models. The numerical results agreed with the measured data with a deviation within 10 percent. Experimental results also showed that if the new innovative design rectangular nozzles replace the old circular nozzle, a more than 50 percent increase in productivity efficiency can be achieved. The newly designed centrifugal separator offers a high-efficiency separation increase from about 30 to 75 percent, even using finer abrasives.

Phase II has been completed. During this phase the pre-prototype design of the improved high efficiency vacuum blasting system was tested at Florida International University (FIU). The results demonstrated an improvement in productivity of 53% for concrete cleaning and 38% for steel plate over the original design.

The design and fabrication of a commercial prototype will be conducted during Phase III of the contract. During this phase of development, design features from the pre-prototype that hindered improvements in productivity will be removed. The heavy weight and poor handling characteristics of the nozzle head are examples of such features. This should lead to additional improvements in productivity.

The contractor has initiated Phase III. Design and testing has been conducted to optimize the orientation of the nozzle configuration.

Current Reporting Period Activities: During this period, the contractor completed the design and fabrication of two nozzles for use in the commercial prototype vacuum blasting system. One is a ¼-inch size nozzle and the other will be of ⅜-inch size. The larger nozzle is for use on large flat surfaces.

The ¼-inch nozzle has been designed and fabricated. The components of the new blast head are made of aluminum. The other parts

that are new design and manufacture are the nozzle housing, inside tub, brush ring, wind curtain, and the connection parts.

The design of ⅜-inch size blast head had been completed. The ⅜-inch blast head is being fabricated at FIU. The ¼-inch size blast head design will be tested at FIU during the week of April 16, 2001. The ⅜-inch design will be tested in mid-May.

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Tech ID 2224

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Technology Deployment for Asbestos Destruction

Objective and Scope: Asbestos Recycling Incorporated (ARI) was awarded a firm fixed-price contract to process 10,000 pounds of Asbestos-Containing Material (ACM) from the Savannah River Site. ARI's thermochemical treatment unit consists of modular components designed for hazardous waste treatment. The system will be used to remineralize asbestos resulting in non-toxic, non-regulated, asbestos-free aggregate suitable for recycling. The modular systems include a waste pretreatment system, rotary hearth, off-gas processing system, and a product-handling system. These systems are designed to accommodate a variety of waste types and contaminants.

Status and Accomplishments: The contract was awarded to ARI on September 30, 2000. On October 20, National Energy Technology Laboratory held a project kick-off meeting that included a presentation from ARI describing the technology to be used, the scope, schedule, and other pertinent aspects of the project. In early October 2000, ARI coordinated with DOE's Savannah River complex and DOE's asbestos abatement contractor to arrange for abated asbestos to be picked up by ARI's selected trucking contractor. ARI contracted with Freehold Cartage, Inc., Eutawville, South Carolina, to pick up the asbestos and transport the material to ARI's facility located in Tacoma, Washington. During this time, ARI also secured a permit from the Puget Sound Air Quality Agency that allows temporary storage of the asbestos pending the issuance of a final and permanent permit.

The asbestos was loaded onto the Freehold Cartage truck on October 18, 2000 and was transported without incident to Tacoma on October 23, 2000. The 441 bags of asbestos were unloaded into a steel shipping container, which was then properly labeled and locked. The asbestos will remain in storage until processed.

Current Reporting Period Activities: No activity reported.

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2.4 Facility Dismantlement and Material Disposition

Robotics Crosscutting Program

Objective and Scope: The Robotics Crosscutting Program (Rbx) supports the DDFA through technology development, close interaction with NETL Industry Programs and the University Research Program in Robotics (URPR), and introduction of new robotics technology into DDFA's LSDDPs. Overall emphasis of the program continues to be design and integration of remote systems and capabilities used for near-term facility deactivation and ongoing surveillance and maintenance activities with extended application to final facility D&D tasks. Deployment of remote D&D systems will reduce worker exposure to hazardous environments and provide productivity increases leading to substantial cost savings.

Status and Accomplishments: Rbx activities during FY2001 in support of the DDFA will focus on the continued development of two remote systems: the Telerobotic Manipulation System (Tech ID 2181) and the Telerobotic Control (Tech ID 2939). The Telerobotic Manipulation System was established as a project within the Rbx D&D product line as a new start in FY1999. From Rbx interactions with the Tanks Focus Area, there is a similar near-term need for a remote system to perform decontamination of pits associated with underground storage tanks at Hanford. Thus, the Rbx D&D activity was merged with the Rbx Tank Waste Retrieval (TWR) project for development of a prototype "Pit Viper" system. The Rbx D&D product line will assist in concept development and may provide operator console and telerobotic controls technologies for use in the prototype. The long-term target for D&D deployment of this system is within plutonium processing canyons at Hanford or Savannah River.

The Telerobotic Control development activity addresses improved remote operation by providing advanced controls capabilities for remote manipulator systems. These advanced controls capabilities will increase effectiveness and efficiency of remote operation. This technology will be integrated with the Compact Remote Console (Tech ID 2180) and deployed within the Telerobotic Manipulation System.

Current Reporting Period Activities: Development continued on the high-level controller (HLC) and graphical user interface for the PC104-based controller. In February, integration and testing of telerobotic manipulation system occurred with the intent to verify communication and functionality between all the basic components and the ability to easily switch between teleoperation and telerobotics. Control of the arm-level controller (ALC) via minimaster, telerobotic control simulator (two joystick flybox Cartesian-based control), or robotic moves commanded from the HLC were all verified. Mode switching was accomplished via the stand-alone personal computer graphical user interface that will be mounted on the telerobotic compact console. While iterative refinement is expected, the major focus will now switch to definition of and preparation for a telerobotics demonstration using the Schilling manipulator and plasma torch. There will also be an ongoing effort to integrate the University of Texas OSCAR software and the University of Tennessee Robot Task Space Analyzer (RTSA), as well as Rbx-developed telerobotics as they become available.

On a slightly different note, a private firm has expressed interest in commercializing the compact remote console (CRC) and the modified Brokk remotizing kit developed by Rbx. Rbx project staff met with the company and provided information packages, and investigation of the intellectual property issues has been initiated. Also, Schilling has expressed interest in the Rbx PC104-based controller and discussions are imminent. Finally, Pacific Northwest National Laboratory (PNNL) has requested a cost estimate for duplication of the PC104 controller hardware, software, and fabrication, and are considering integration of the CRC for use with their Titan II manipulator.

For more information:

Tech ID 921

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2.5 Worker Safety and Other Projects

Protective Clothing Based on Permselective Membrane

Objective and Scope: Membrane Technology and Research (MTR), Inc., is developing and demonstrating improved protective clothing that provides protection equivalent to current garments, but is lighter weight to improve comfort and is breathable to allow water vapor to escape, therefore reducing heat stress. Improved protective clothing will be made of an innovative ultra-thin, permselective outer membrane. The membrane is extremely permeable to water vapor escaping from the wearer, but highly impermeable to hazardous compounds. Fabric properties will be optimized and prototype suits will be tested during Phase I. In Phase II, 20-30 suits will be fabricated and used in a variety of extensive, comparative trials in the laboratory and at a non-hazardous site.

Status and Accomplishments: Development of fabric materials and laboratory tests on the fabric has been completed. In laboratory tests, water vapor transmission rates of 600x900 g/m2/day have been measured through the fabric. This water vapor transmission rate is far superior to butyl rubber suits with a water vapor transmission rate of 0x10 g/m2/day. Chemical vapor transmission rates have been equal to or lower than rates for the fabrics of commercial suits.

Uretek laminated two rolls of the fabric. One roll of fabric (90 m by 30 in.), MTR1, uses rip-stop nylon as both inner and outer layers, and the second roll (40 m by 30 in.), MTR2, uses the rip-stop nylon on the outside and a flexible, lightweight, non-woven fabric on the inside. The prototype suits manufactured by Kappler Systems received the following tests by outside laboratories: chemical permeation, physical properties, sweating mannequin, and heat stress modeling. In general, the results are not as good as expected; although the fabrics do combine water permeability and reduced heat stress with chemical protection, neither the chemical permeation resistance nor the reduction in heat stress was as high as hoped. The economic analysis was updated based on this new data. The analysis shows that MTR1 provides the greatest benefits in productivity; however, the benefit does not appear to justify the higher cost of the suit made of this fabric. MTR2 fabric has less productivity benefit and a higher selling price, and so is less attractive than MTR1.

The Phase II permselective garment testing by the International Union of Operating Engineers (IUOE) was concluded in August 1999. The garments tested for personnel comfort and well-being were those assembled by MTR's potential commercialization partner from the permselective fabrics supplied by MTR, Tyvek, and non-breathable garments like Saranex. The garments were all full bodysuits with hoods (for comparison purposes), and contained a more spacious cut in the chest and waist/crotch area than other manufactured garments, and this was very noticeable and appreciated by the test personnel. This also helped the garments to be more durable. Examples of tasks performed include crawling through confined spaces, performing metal grinding, and loading and hauling material in a wheelbarrow. In general the MTR garments were as comfortable with respect to heat-stress as the Tyvek garments, and were much more comfortable than the non-breathable garments. The test personnel all had very good comments concerning the MTR garments. Communications have been initiated

An innovative fabric combines an ultrathin, permselective outer membrane with a sorptive inner layer.

with a potential commercialization partner and an economic analysis has been initiated.

Current Reporting Period Activities: A review of the International Union of Operating Engineers Final Report on the testing of MTR's garments has continued. In the meantime, MTR continues to assemble the latest economic analysis based on the expertise and manufacturing capabilities of their potential commercialization partner. The initial economic analysis a few years ago showed the cost of the permselective suit at around $60 per unit. The latest economic analysis shows the cost of the suit to be approximately $40 to $45 per unit. Preliminarily indications also show that the highest cost item of the suit is no longer the permselective material, but the assembly costs for the suit.

For more information:

Tech ID 95

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Integrated D&D Decision Analysis Tool

Objective and Scope: The objectives of this work are to develop a computer-based Survey Module, update the existing computer-based Decontamination and Decommissioning Technology Database Module, integrate the Survey Module and the D&D Technology Module, and distribute the integrated software. FedTech, Arrey Industries, NES, and Research Triangle Institute have teamed to accomplish this effort. The existing D&D Technology Database Module being updated under this task was developed under a previous contract with Arrey Industries, NES, NEXI and Research Triangle Institute. The Survey Module will be able to cost effectively assist in preparation and execution of plans for initial facility surveys, operational surveys during D&D work, and final facility release surveys. The Survey Module will estimate the budget, schedule, labor, radiation dose, waste generation, and equipment requirements to perform these surveys along with defining the number and location of survey points and recommended survey instruments. The Survey Module will integrate the collection, storage, and reporting of survey data.

Status and Accomplishments: This project is closing out and a final report is being generated.

Current Reporting Period Activities: No activity reported.

For more information:

Tech ID 173

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Modular Manipulator for Robotic Applications

Objective and Scope: This project focuses on the needs of Automated Plutonium Processing (APP) tasks that involve the manipulation of plutonium containers and the transfer of their contents. Specific challenges of APP gloveboxes include restrictive entry ports, confined workspace, limited maintenance access and destructive plutonium particulates, which make this task virtually impossible to automate with existing technology.

In order for automation systems to be successful within DOE facilities, they must provide maximum functionality, flexibility, ease of use, and reliability, while facilitating the rapid deployment of each custom system. This work concentrates on in-depth design and deployment of self-contained actuator modules, which will be used to construct a robotic manipulator tailored for APP tasks. A human-scale manipulator will be built from two sizes of DISC Actuator and will replace existing human labor within plutonium gloveboxes. The modular nature of ARM Automation's technology readily enables installation and maintenance of automation within "hot" boxes.

Status and Accomplishments: A survey of the state-of-the-art modular manipulators design is completed. This survey addresses modular manipulators developed inside government laboratories, universities, and private industry for such applications as space exploration or control research and commercially viable industrial applications. Based on this study, it is possible to define the requirements of one manipulator system that can be used to conduct automated transfer operations within plutonium gloveboxes and some D&D applications. The test plan for the testing of the manipulator at ARM's facility has been completed. Integration of the subcomponents has also been completed and the system has been prepared for testing.

Current Reporting Period Activities: The system is currently being tested at the contractor's facility and final tests are planned by the end of May 2001. It is possible that the contractor will be able to demonstrate the technology in June but the final selection of a demonstration site has not been confirmed. LANL and ORNL have indicated an interest in this demonstration.

For more information:

Tech ID 2199

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"The Survey Module will be able to cost effectively assist in preparation and execution of plans for initial facility surveys, operational surveys during D&D work, and final facility release surveys."

3.0 Programmatic Structure and Organization

The Office of Science and Technology (OST), as part of DOE's Office of Environmental Management (EM), manages a national program to conduct basic and applied research, and technology development/demonstration/deployment that is essential to completing a timely and cost-effective cleanup of the DOE nuclear weapons complex. OST provides environmental research results, as well as cleanup technologies and systems to meet EM program high priority science and technology needs while reducing technological risks and cost of implementation of effective solutions. The OST works closely with both the Office of Site Closure (EM-30) and the Office of Project Completion (EM-40) to accomplish its mission.

To achieve a comprehensive, integrated approach to developing and providing science and technology solutions, EM has separated the site cleanup needs into a set of five problem areas. A Focus Area has been established to plan and manage EM's research and development investments to develop solutions to each of these five problem areas:

- Deactivation & Decommissioning Focus Area
- Tanks Focus Area
- Nuclear Materials Focus Area
- TRU and Mixed Waste Focus Area
- Subsurface Contaminant Focus Area

In addition, three crosscutting technology areas were established where technology needs and targets are relevant to more than one Focus Area:

- Characterization, Monitoring and Sensor Technology (CMST)
- Efficient Separations and Processing (ESP)
- Robotics

The Industry Program conducts competitively selected activities that involve the private sector in developing, demonstrating, and implementing improved technologies that address the needs of the focus areas and the crosscutting areas.

The result of this structure of programs is that the D&D Focus Area is positioned to support those research areas defined as highest priority by EM-50 and DOE customers.

The Role of NETL

The Federal Energy Technology Center, with physical sites in both Pittsburgh, Pennsylvania and Morgantown, West Virginia, was redesignated by Former U.S. Secretary of Energy Bill Richardson, as the National Energy Technology Laboratory (NETL). As the 15th national laboratory, NETL becomes part of the national laboratory research system. This is the largest research system of its kind in the world with more than 30,000 engineers and scientists conducting research and research and leading-edge experiments. As part of this system, the new National Energy Technology Laboratory will join Argonne National Laboratory (Illinois); Brookhaven National Laboratory (New York); Lawrence Berkeley National Laboratory (California); Fermi National Accelerator Laboratory (Illinois); Idaho National Engineering & Environmental Laboratory (Idaho); Lawrence Livermore National Laboratory (California); Los Alamos National Laboratory (New Mexico); National Renewable Energy Laboratory (Colorado); Oak Ridge National Laboratory (Tennessee); Pacific Northwest National Laboratory (Washington); and Sandia National Laboratories (New Mexico and California).

Rita A. Bajura, NETL Director, a career federal executive with more than 18 years experience in government-industry energy partnerships, continues in her leadership position as head of the single management team that serves both physical sites with a combined working force of more than 530 federal scientists, engineers, and administrative staff. NETL is responsible for nearly 600 research projects; most involving the development of advanced fossil fuel technologies.

In addition to the new national laboratory's core capabilities, Secretary Richardson announced that a newly created Center for Advanced Natural Gas Studies, would be an integral part of NETL's research endowment.

Senator Robert C. Byrd (D-WV) remarked in the course of the dedication that, "Much of the laboratory's work is dedicated to the worthy goal of developing innovative, clean and efficient technologies that will allow our nation to meet its growing energy needs.

As the nation's newest national laboratory, it will continue to help light a pathway for a new era of energy use that will ensure a comfortable standard of living for our children and our children's children."

NETL also manages a significant portion of the technology development needed to clean up sites in the government's nuclear weapons complex. In February 1995, the then Morgantown Energy Technology Center was selected by EM-50 to be the implementing organization for the D&D Focus Area. As such, it brought the experience gained from being the implementing organization for the Industry Program, which competitively selects industrial R&D performers through Research Opportunity Announcements (ROAs) and Program Research and Development Announcements (PRDAs). As the lead organization for D&D implementation, NETL is responsible for the planning, monitoring, and evaluating RDDT&E pro-jects to meet the requirements of EM-50 and its customers in EM-30.

Stakeholder Feedback

The stakeholders in the D&D Focus Area include DOE headquarters; DOE operations offices; DOE sites and their operating contractors; D&D technology developers and users in the private sector; federal, state, and local regulators; and the communities around affected DOE facilities. These stakeholders have been providing input to focus area planning and implementation; program contacts are provided on the first page of this report.

"It's time we elevate the profile and prestige of this world-class facility, which has been helping solve energy and environmental problems for more than 50 years,"

Bill Richardson, Former U.S. Secretary of Energy,
National Energy Technology Laboratory
Dedication Ceremony

4.0 Background

The D&D Focus Area was established to develop and demonstrate improved technologies and systems that could solve customer-identified needs to characterize, deactivate, survey and maintain, decontaminate, dismantle, and dispose of or recycle DOE surplus facilities and their contents. The mission also includes facilitating the acceptance, approval, transfer, commercialization, deployment, and implementation of these technologies and systems.

These technologies are needed to address the pressing needs of deactivating more than 7000 contaminated buildings and decommissioning more than 700 buildings. In addition, material disposition is required for over 600,000 tons of metal and 23 million cubic meters of concrete in contaminated buildings and for 400,000 tons of metal currently in scrap piles. The major drivers for this focus area are the high safety and health risks associated with working in aged and contaminated facilities and the high costs associated with facility deactivation, sur-veillance, and maintenance using currently available baseline technologies.

D&D Focus Area Strategy

Subsequent to the selection of NETL as the lead organization for the D&D Focus Area, a program review of all FY95 projects was held in May 1995. Based on this and other recent program reviews, as well as the general requirement for fiscal constraint throughout, the following strategies were developed:

Programmatic Strategy

- Focus D&D technology development program on large-scale demonstrations emphasizing full-scale demonstrations using a suite of improved technologies.
- Demonstrate technologies only through large-scale demonstrations.
- Focus on technologies that are identified as high priority by customers, that have wide applicability, and that have a commitment to be considered for use by customers.
- Emphasize demonstration and deployment of private-sector technologies.
- Technical Strategy

In the near term, emphasize technologies to effectively support:

- deactivation of facilities,
- decontamination of surfaces,
- reuse of bulk contaminated materials,and
- application of remotely operated dismantlement systems

In the middle term, emphasize technologies to effectively support:

- applications of remote surveillance systems,
- characterization of volumetrically contaminated materials,
- decontamination of bulk materials, and
- adoption of release standards for bulk contaminated materials.

Large-Scale Demonstrations and Deployment Projects

A cornerstone of the D&D Focus Area is its series of large-scale demonstration and deployment projects. The LSDDPs demonstrate innovative and improved D&D technologies at full scale, side by side with existing commercial technologies. The intent is to compare benefits from using a suite of improved and innovative D&D technologies against those associated with baseline D&D technologies. This approach provides an opportunity to test improved and innovative D&D technologies at a scale that will provide meaningful cost and performance information to the potential end-users of the technology.

5.0 Upcoming Events

June 2001

American Nuclear Society Annual Meeting

June 18–21, 2001
Milwaukee, WI

July 2001

American Nuclear Society Executive Conference: Nuclear Facility Decommissioning and Used Fuel Management

July 8–11, 2001
Mashantucket, CT

August 2001

Albuquerque Needs Workshop

August 22–23, 2001
Santa Fe, NM

September 2001

American Nuclear Society Decommissioning, Decontamination & Reutilization Meeting

September 23–27, 2001
Knoxville, TN

November 2001

American Nuclear Society Winter Meeting

November 11–15, 2001
Reno, NV

Technology Information Exchange Conference

November 13–15, 2001
Albuquerque, NM

We list conferences and workshops of interest to our readership. Please let us know if you would like us to include your event on this page.

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